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# Data base management and quality control approaches: Users and developers

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## ABSTRACT

*The widespread use of Computer Integrated Manufacturing, the quest for Total Quality Management, and the increasing role of technology management have given an added importance to today's application of DBMS and the accuracy of its data. Indeed, the empirical evidence has documented data inaccuracy as the most difficult part of implementing information systems softwares. This paper explores the process of building a data base necessary to ensure the quality of the data for conversion into information. This article also illustrates the application of quality control techniques for maintaining data base quality.*

## INTRODUCTION

In today's business environment, managers at all organizational levels are continuously forced to make decisions that affect profitability, productivity, and quality. These decisions are becoming more complex in the presence of global competition. Manufacturing and management science techniques along with well implemented decision support systems are the necessary means that help managers to formulate policies for improvements in the most effective manner.

A decision support system (DSS) includes a data base management system (DBMS), a model management system, and a user dialogue system (Sprague and Carlson, 1982). A data base is basically a collection of relevant data stored in such a way that it can be found, retrieved, and manipulated by the user. This general definition includes examples such as notebooks, telephone books, and file cabinets. An electronic data base, however, is the most efficient way of storing, retrieving and manipulating data today. The DBMS typically consists of several data bases and has the ability of maintaining and manipulating data stored in a data base. It is a fourth-generation application software that enables the user to interact with many data bases.

The model management system is what differentiates a DSS from MIS by integrating statistical and management science models with the DBMS. Finally, the user dialogue system links the data and model management systems and provides the power and flexibility of the DSS.

Today, the widespread use of computer integrated manufacturing, the need for increased quality, and implementation of Just-in-Time philosophy have made the DBMS more important than ever. Ford Motor Company's new automated distributor-assembly line which requires a variety of production statistics, for example, is using a DBMS (called OSCAR for on-line system for control analysis and reporting) that interfaces with an escort memory system (EMS) for data collection to provide the relevant information (Allen, 1989). OSCAR collects data automatically from process or input devices such as computer terminals, bar code readers, and EMS. Polaroid Corporation's Negative Manufacturing Division provides another example in which a DBMS (called RS/1) controls the production test data (Charif, 1986). RS/1 allows the company to perform complex data analysis and make decisions that affect film quality. Test engineers measure different performance criteria and characteristics during the manufacturing process. The relevant data can be retrieved easily from the data base in the next (coating) operation. Thus, RS/1 enables the company to study product performance after a particular production run.

These and other examples of successful application of the DBMS show the value and importance of data quality and accuracy in today's manufacturing environment. Indeed, the empirical evidence has documented data inaccuracy as the most difficult part of implementing information systems softwares. Material Requirements Planning, for example, requires its two data base files, inventory records and Bill of Materials to be at least 98 percent accurate.

Importance of quality data is by no means limited to the manufacturing environments. With the U. S. experiencing a shift from a manufacturing to a service orientation, and the significance of providing quality service as a result of international competition, many companies such as Contel Telephone Operations in California are determined to improve their data processing quality. Company policy, technical procedures, standards, quality control, and quality assurance are some of the factors that are addressed in Contel's approach toward data processing quality (Attaran and Routh, 1988). Quality assurance specialists oversee data processing quality control by analyzing data requests, identifying and analyzing problems, recommending process changes, and providing statistical reporting and feedback.

AT&T Company is also involved in control and improvement of the quality of the data it uses in managing its business, conducting its daily operations, and operating its worldwide intelligent network. AT&T Company's data quality program consists of developing the technical foundations for understanding and measuring data quality, extending and applying process management techniques to information management, extending and applying methods of statistical quality control, and developing and applying methods that help ensure data quality in a data processing environment (Huh, Keller, Redman, and Watkins, 1990).

The purpose of this paper is, therefore, to explore the process of building a data base that is necessary to ensure the quality of the data as it is being processed and turned into information. Also, this paper studies and illustrates the process of controlling data base quality using quality control charts for further improvements.

## DATA BASE QUALITY AND ITS ELEMENTS

In the business world, quality is perceived from the customer's point of view. Products should be produced in order to meet the customer's needs. Although the producer builds quality, it is the user who ultimately provides standards for quality of products produced or information processed. It is important that the data should be prepared and managed through ways in which it is used by the analysts (Foster and Franz, 1990). Unfortunately, this simple and important aspect is missed by many firms.

Many different opinions about what attributes are important in achieving a high quality data base system exist. Should the user, the buyer, the developer, or the maintainer of the system determine the standards? Based on Juran's definition of quality as being "the fitness for use as perceived by the customer," the data base should be developed and maintained in order to enable the user to use it effectively. Also, the user's qualifications and the way in which the information is utilized can have a significant impact on the perception and measure of a quality data base system. In other words, it is important to know who, in terms of qualifications, is planning to use the data base system. Recent studies (Evans and Ward, 1990) show that, in most cases, the significant role of the end users in the evaluation process is ignored. That is, people who are responsible for system design are usually responsible for system evaluation, and this dual responsibility leads to bias.

In order to effectively establish data base quality specifications, the following quality requirements should be considered during the development and implementation processes:

1. Correctness requirements—It is the degree to which the data base satisfies specific requirements.
2. Reliability requirements—It is the extent to which the data base consistently performs specific functions.
3. Efficiency requirements—It is the ratio of the actual to the budgeted resource utilization.
4. Simplicity requirements—It is the time and effort required to prepare the input, use the system, and interpret the output.

These requirements along with the experience of the developer and the qualifications of the user, should be utilized for establishing the management quality specifications. According to this approach, the process of developing a data base needs to be integrated into teams of users, developers, and maintainers in order to permit the concentration of collective mental resources for the production of a quality, flexible, and accurate data base system.

## DATA BASE QUALITY CONTROL APPROACH

Information system quality assurance technique is one of the existing popular approaches to achieving the optimum quality data base system. It is the process of preparing similar and compatible standards for developing and utilizing information. Due to the complexity of its activities, the process must follow a systematic approach of being planned, organized, monitored, and constantly readjusted and updated in order to reach the optimum quality. Some of the direct functions that must come together in order to achieve an optimum quality information base include:

- a. *Technical Quality Function*—This consists of activities of quality requirements, quality specification, and quality planning. The primary goal of this function is to define data base quality in a way that is achievable. Moreover, the tools, procedures, and standards must be identified through a teamwork of the users and the developers of such a system. Staffing and continuous training of personnel, for working with the system, is another major activity of this function that must be considered. The final steps should include formulating quality requirements, total quality plan, and quality performance status report.
- b. *Quality Measurement Function*—For given quality element in the data base, one can develop a goal regarding the percentage of non-conformities allowed. As Figure 1 shows, there is a trade-off between the user and the developer of the data base for achieving quality in relation to its cost. The optimum quality should be searched for at the minimum point of the total quality cost where there is a balance in that trade-off. As it is indicated, the actual percentage of non-conformity taken from the random samples while the data base is being used, can be charted against the optimum percentage of non-conformity obtained from Figure 1. When the actual percentage of non-conformity in the random samples exceeds the specified optimum limit, a corrective and preventive approach should be implemented. It is noteworthy that Figure 2 can be used as early alarming signal for the end user before a costly incidence in using the data base occurs. That is, the end user can detect easily the existence of any upward trend in the pattern of actual percentage of non-conformity distribution, and thus can take preventive maintenance action before it exceeds the specified limit. Corrective actions can be taken only when a flexible data base system is utilized.

## CONCLUSION

The purpose of this paper was to explain the elements of building a quality data base and to illustrate controlling its quality factors through quality control techniques. In today's world of fast technological changes and tight global competition, much has been emphasized on quality of data base management and on pertinent information in producing goods and providing services. It is clear that products should be produced in order to meet the customer's needs. That is, although the producer builds quality, it is the user who ultimately provides standards for quality of products produced or information processed. Obviously, like beauty, quality is in the eye of the user; and it should be developed and maintained in order to enable the user to utilize it effectively. It should also be considered that the user's qualifications and the way in which the information is utilized can have a significant impact on the perception and measure of a quality data base system. That is, one can achieve quality when it is specified. Therefore, it is important to know who, in terms of qualifications, is planning to use the data base system. Consequently, contrary to the popular belief, quality is not free in developing data base information systems. Instead, there exists a trade-off between the user and the developer of data base for achieving quality. Figure 1 illustrates the process of achieving the optimum quality standards in relation to such a trade-off. Moreover, it is important that the existing quality standards be traced and measured for control and future improvements as illustrated in Figure 2. Finally, it is imperative that the optimum quality be specified before fundamental factors such as the system architecture and integration with other computerized systems in the organization are considered.

Figure 1

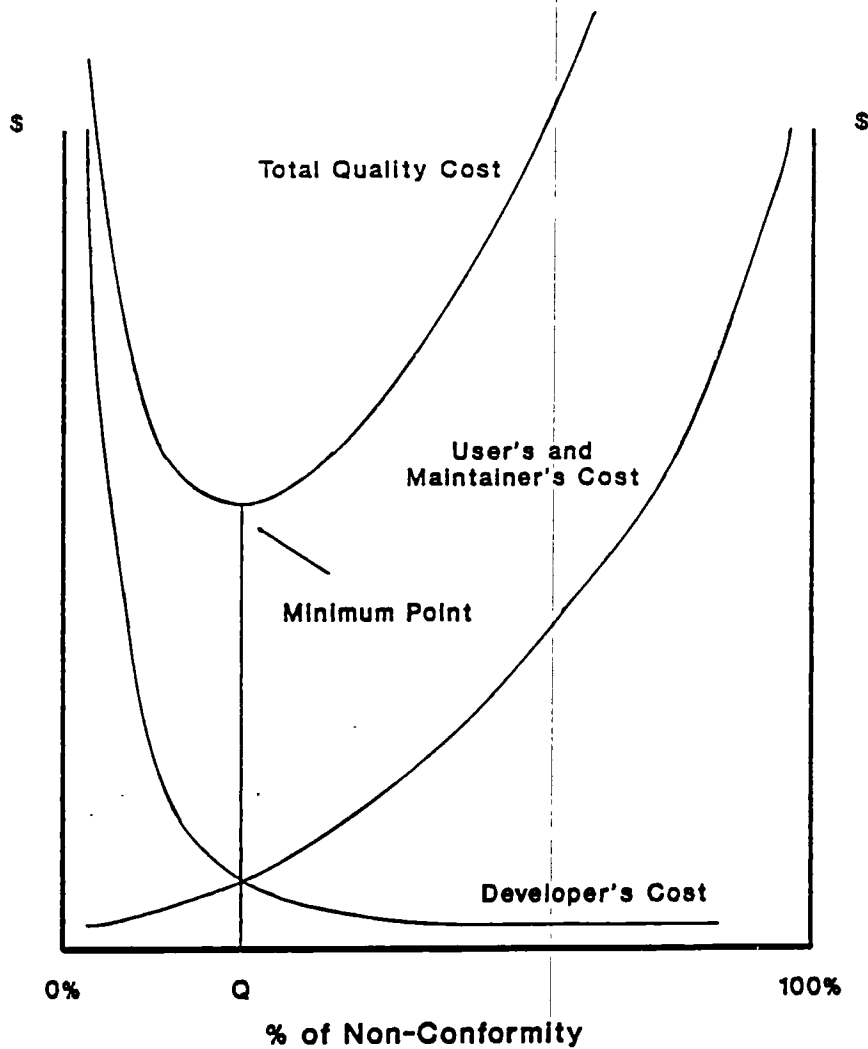
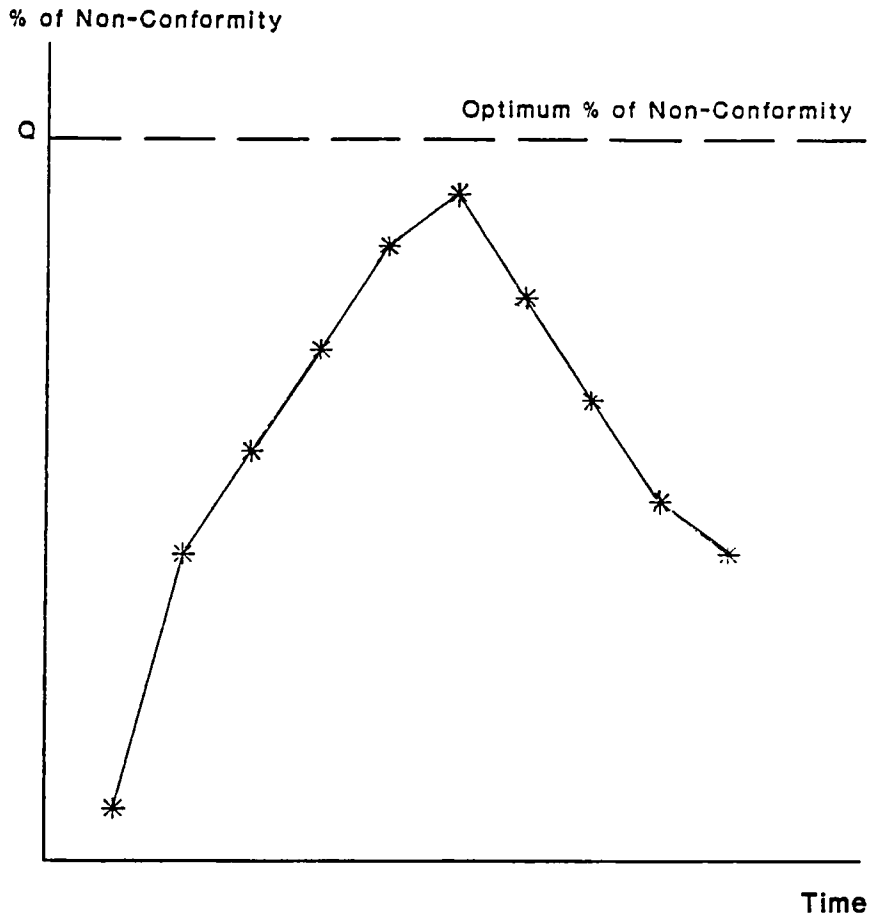


Figure 2



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